Swayam Chube

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swayamchube
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Education

2024 – Present **Indian Institute of Technology Bombay, India** Cumulative GPA: 9.44/10
M.Sc. in Mathematics Mathematics GPA: 10/10

2020 – 2024 **Indian Institute of Technology Bombay, India**
B.Tech. in Computer Science and Engineering

2018 – 2020 **Narayana Junior College, Mumbai, India** 94%
Intermediate/+2

Reading Projects

2024 **Representations of Reductive p-adic groups** *Prof. Dipendra Prasad, IIT Bombay*

- Read through the first 10 sections of Stephen DeBacker's notes on *Representations of Reductive p-adic groups*, and as a by-product, also learnt some theory of algebraic groups on the fly.
- Had weekly meetings with my supervisor and summarized the material read in that week.

Representations of Compact Lie Groups *Prof. U. K. Anandavardhanan, IIT Bombay*

- Read through the first four chapters of *Representations of Compact Lie Groups* by Theodore Bröcker and Tammo tom Dieck. Supplemented this reading with Daniel Bump's *Lie Groups*.
- Gave presentations on the Peter-Weyl Theorem and Cartan's Theorem on conjugacy of Maximal Tori to my supervisor.

Tate's Thesis *Prof. Sandeep Varma, TIFR Mumbai*

- Read through Ramakrishnan and Valenza's *Fourier Analysis on Number Fields*.
- Supplemented the chapters on harmonic analysis with Folland's *A First Course in Harmonic Analysis*, especially for Pontryagin Duality.
- Gave a final presentation on the analytic class number using adelic measures as derived by Tate in his thesis.

Algebraic Geometry *Prof. Saurav Bhaumik, IIT Bombay*

- Read through Chapter I and the first two sections of Chapter II of Hartshorne's *Algebraic Geometry*.
- Weekly meetings with supervisor would generally be about drawing analogies between the theory of smooth manifolds and affine varieties. Also had brief discussions on vector bundles towards the end.
- Prepared an (in-progress) set of solutions to Hartshorne's exercises (mainly Chapter II).

Class Field Theory *Prof. Dipendra Prasad, IIT Bombay*

- Read Chapters I through V of Milne's notes on *Class Field Theory*. Supplemented this reading with Cassels and Fröhlich's *Algebraic Number Theory* for Group Cohomology.
- Read through the proofs of Local Class Field Theory in detail and learnt about the adelic and ideal theoretic formulation of the main results of Global Class Field Theory (no proofs).

Reading Projects (continued)

2023 **Algebraic Topology** *Prof. Saurav Bhaumik, IIT Bombay*

• Mainly followed Hatcher's *Algebraic Topology* and read the chapters on Fundamental Groups, Homology and part of the chapter on Cohomology (up to cup products). Supplemented this reading with Rotman's *An Introduction to Algebraic Topology*.

Set Theory and Forcing *Prof. Bharat Adsul, IIT Bombay*

• Followed Kunen's *Set Theory: An Introduction to Independence Proofs* while covering just enough to get to Paul Cohen's method of "forcing".

• Gave weekly presentations to supervisor in the material learnt in that week.

Service

2022–2024 **Teaching Assistantship** *IIT Bombay*

2024	**MA 105 (Calculus)**	*Instructor: Prof. Swapneel Mahajan*
2024	**MA 419 S (Basic Algebra)**	*Instructor: Prof. Shripad Garge*
2024	**MA 414 S (Algebra I: Galois Theory)**	*Instructor: Prof. Shripad Garge.*
2024	**MA 414 (Algebra I: Galois Theory)**	*Instructor: Prof. Saurav Bhaumik*
2023	**MA 106 (Linear Algebra)**	*Instructor: Prof. Dipendra Prasad*
2023	**MA 111 (Calculus II)**	*Instructor: Prof. Preeti Raman*
2022	**CS 228 (Logic for CS)**	*Instructor: Prof. Krishna S.*
2022	**MA 106 (Linear Algebra)**	*Instructor: Prof. Gopal Krishna Srinivasan*

Responsible for conducting problem solving sessions for a batch of students throughout the semester, helping them clear conceptual doubts through personal interaction, and grading papers. Created LaTeXed notes which were referred to repeatedly by multiple students. Also conducted various "cram sessions" for students before major exams.
In some cases, I have also been involved in making problems for the tests.

2023, 2024 **Mentor, Summer of Science**

Guided students interested in Abstract Algebra, Topology, Combinatorics, and Real Analysis by creating an action plan, recommending resources, clearing doubts, having discussions, and reviewing their reports

Various Expository Notes

Over the past year, I have written quite a few notes and mini-expositions on topics that I found interesting. They can be found here.

Scholastic Achievements

2020-2024 Conferred with an AP grade in the following courses: Calculus I, Numerical Analysis, Ordinary Differential Equations, Complex Analysis, Multivariable Calculus, Partial Differential Equations.

2022, 2023 Listed in the top quartile in the Simon-Marais Mathematics Competition

2020 Secured an All India Rank of 8 in JEE Advanced among more than 0.15 million aspirants

Secured an All India Rank of 1 in JEE Main among 0.88 million aspirants

Scholastic Achievements (continued)

- Received the prestigious KVPY fellowship with All India Rank 22 awarded by DST, Govt. of India
- Among 46 students invited to the IChO (International Chemistry Olympiad) training camp at HBCSE

2019, 2020
- In top 1% students across Maharashtra in NSEP (National Standard Examination in Physics) and was invited to take the INPhO (Indian National Physics Olympiad)

2018
- Among 35 students invited to the IMOTC (International Mathematics Olympiad Training Camp) at HBCSE

Selected Coursework

Computer Science
- Extremal Combinatorics (AA)
- Randomized Algorithms (AB)
- Algebraic Automata Theory (BB)

Mathematics
- Representation Theory of Lie Algebras (AA)
- Non-commutative Algebra (AA)
- Commutative Algebra (AA)
- Graduate Level Galois Theory (AA)
- Functional Analysis (AA)
- Theory of Analytic Functions (AA)
- Fourier Analysis and Applications (AA)
- Differential Topology (AA)

Technical Skills

Software: LaTeX, MATLAB, Git

Programming: C++, C, Python, Bash, Java

Extra-Curriculars

2024
- Was part of the paper-setting team for the IITB Mathematics Olympiad organized by the Mathematics Association of IIT Bombay